mathématiques

autonome

a simple guide for home use

metrics will be easier

contents

Published by the Metric Advisory Board

why New Zealand is changing

With more than 90 per cent of the world's population already using the metric system, and virtually every other part of the British Commonwealth planning the change, New Zealand could not but follow.

The system has won world acceptance because it is the best yet devised — more than 100 countries have already proved it.

No change of such magnitude is accomplished without some problems.

This unfamiliar system will undoubtedly cause some confusion and anxiety, particularly among older people, but the benefits will far outweigh the disadvantages once the changeover is behind us.

Metric units mean faster and easier calculations and universal uniformity in measurement, with far-reaching dividends for trade, education, science and technology, finance and tourism . . . in fact, all communication between all peoples.

Future historians may one day record that metrication — the move to a common language of measurement — was the world's first major step, in fact, towards that greatest goal of all — a universal language.

Adoption of the metric system cannot but bring immeasurable gains to New Zealand and also will promote better world understanding. The Government initiated the changeover, and through the Metric Advisory Board and the services of many government departments, it is providing facilities to advise and guide industry and commerce, farmers, and the public at large, so that they may make the step into the metric world as smoothly as possible. This booklet should help you all to become at home with metrics.

Warren Freer.

Minister of Trade and Industry.

the metric system

Most common units

for measuring	unit	symbol
length	metre	m
capacity	litre	l
weight	kilogram	kg
temperature	degree Celsius	°C

New Zealand is changing to the International Metric System of measurement — the simplest measuring system mankind has yet devised.

Calculations can be done quickly and accurately because multiplication and division of the basic units are done in tens.

Measuring weight, you work in grams for small quantities, and find there are 1 000 grams to the kilogram and 1 000 kilograms to the tonne. Measuring capacity, you work in litres — there are 1 000 millilitres in a litre.

Most people are already familiar with degrees Celsius for temperature, from freezing at 0 °C to boiling water at 100 °C.

The four most commonly-used units in the home, and their symbols, are:

* The metre (m) for measuring length.
* The kilogram (kg) for measuring weight.

* The litre (l) for measuring liquid capacity.
* The degree Celsius (°C) for measuring temperature.

No matter what calculation is being done the same simple rules apply.

For length, for instance, if you want to measure very small dimensions you'll use the millimetre, which is one-thousandth part of a metre, or the centimetre, which is one-hundredth of a metre. If you want long distance, you'll go up to the kilometre, which is 1 000 times the metre.

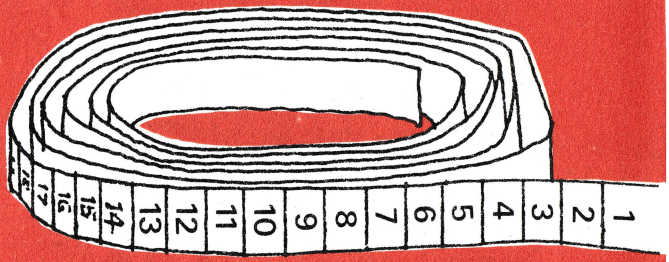
PREFIXES

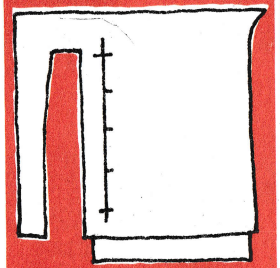
Throughout all metric calculations common prefixes are used to show the numbers of the various units involved — for instance, "milli" (meaning one-thousandth) is employed in millilitres and millimetres.

The common prefixes are: milli (m) one-thousandth; centi (c) one-hundredth; kilo (k) one thousand times; mega (M) one million times.

length

The units are: millimetre, centimetre, metre and kilometre



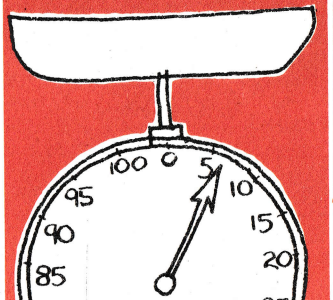


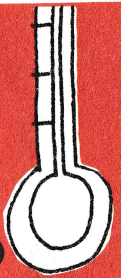
capacity

Liquids are measured in litres and millilitres

weight

The units are: gram, kilogram and tonne

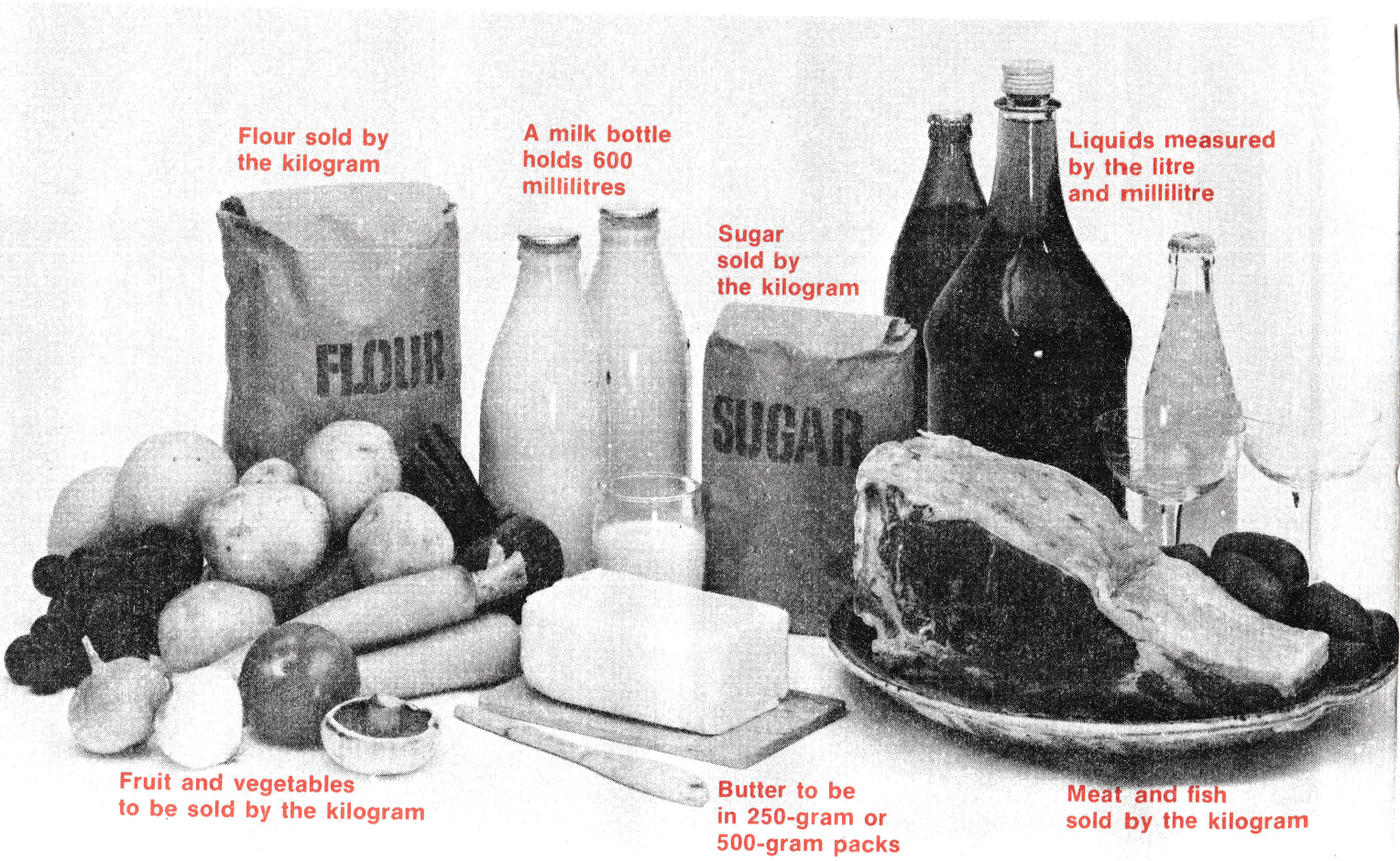




(°C)

temp-erature

The degree Celsius is used to measure temperature


Flour sold by the kilogram
A milk bottle holds 600 millilitres
Sugar sold by the kilogram
Liquids measured by the litre and millilitre
FLOUR
SUGAR
Fruit and vegetables to be sold by the kilogram
Butter to be in 250-gram or 500-gram packs
Meat and fish sold by the kilogram

shopping

FOOD

Most shoppers are already partly converted to metrics in the supermarket and food store, because many packaged goods are marked in both metric and imperial quantities. In any case, you buy many of your supplies by eye, choosing pack sizes, numbers of chops, or fruit, etc., by your needs.

The Metric Advisory Board's price guide will help you to make your decisions about quantities and prices. This guide will be available for general distribution in a handy size and copies will also be displayed in shops. See pages 12 and 13 of this booklet for your home copy of the metric price guide.

Meat and Fish are being sold over the counter by the kilogram. If you need smaller quantities ask in grams and, it is suggested, in steps of 100 grams (500 grams is just over a pound). Scales for weighing meat and fish are being changed to metrics throughout this year — 1974.

Fruit and Vegetables will be sold in the same way as meat and fish, as scales are changed in 1975 and 1976.

LIQUIDS

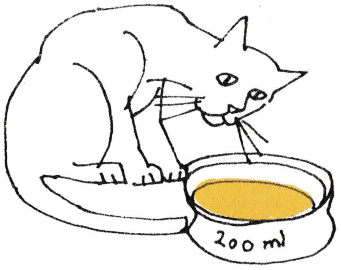
Liquids are now measured in litres and millilitres, replacing gallons, quarts, pints and fluid ounces (1 litre is about 1¾ pints). Smaller quantities will be sold in bottles holding measures such as 25, 50, 75 and 100 millilitres.

LOOSE GOODS

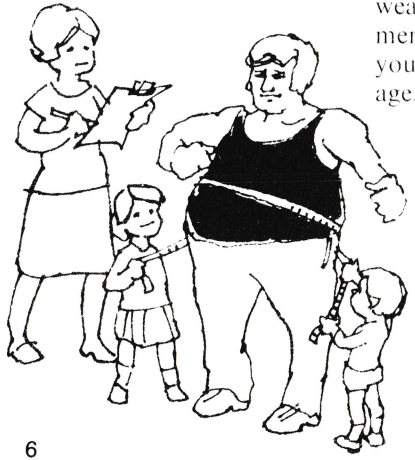
For bulk or loose goods, ask for the metric quantity nearest your required purchase. For example, 500 grams instead of a pound (1 000 grams = 1 kilogram; 1 kilogram is just over 2 pounds).

MILK

A bottle of milk holds 600 millilitres (ml), (just over a pint); a half bottle 300 ml, a quarter bottle 150 ml.



shopping



READY-TO-WEAR CLOTHING

Garment manufacturers will use the metric system in making clothes. These metric garments will begin to go on sale from the middle of this year (1974).

Generally speaking, you will not find much difference when you are shopping for metric clothes. For example, if you now wear size 14, you will probably still wear garments labelled size 14 in metric. If you buy your children's clothes according to their age, you will continue to do so.

Some garments, for example, business shirts, underclothing and certain makes of jerseys, will continue to be labelled according to body measurements. But these will be in centimetres.

Use a metric tape measure to find out your own body measurements and those of your family.

The main ones you will need to know will be bust or chest, waist, hip, arm length, neck and inside leg length. Other helpful measurements to know are height, back length from neck to waist, and skirt length.

HOUSEHOLD LINEN AND SOFT FURNISHINGS

Soft furnishings, towelling, sheeting and other household fabrics went metric from early this year (1974), with widths in centimetres and lengths in metres.

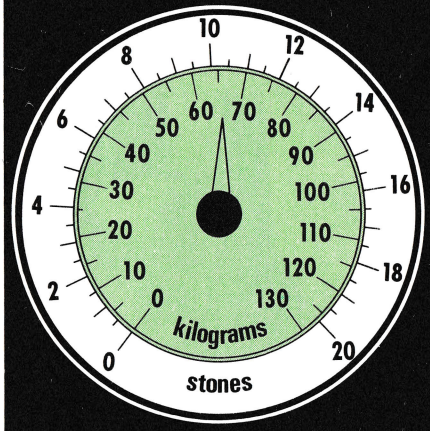
Ready-made household items such as bedspreads, sheets, blankets, pillows and pillowcases, curtains and tablecloths began this year to be measured in centimetres as near as is convenient to the old imperial sizes. Before shopping for these items use your metric tape measure to find out the dimensions of your bed, pillow, table, etc. Or you can simply ask for, say, "A pair of sheets to fit a three-foot bed."

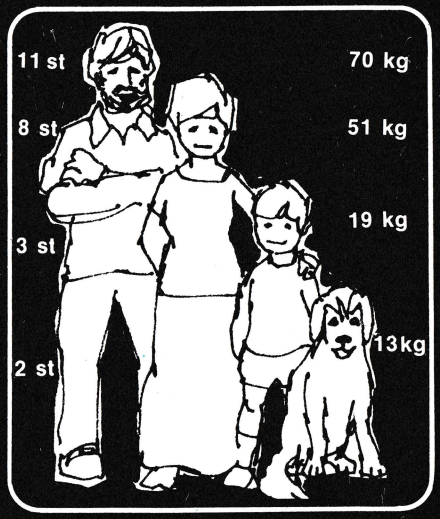
ELECTRICITY

There will be no change in the method of charging for household power, which will continue to be rated in kilowatt hours.

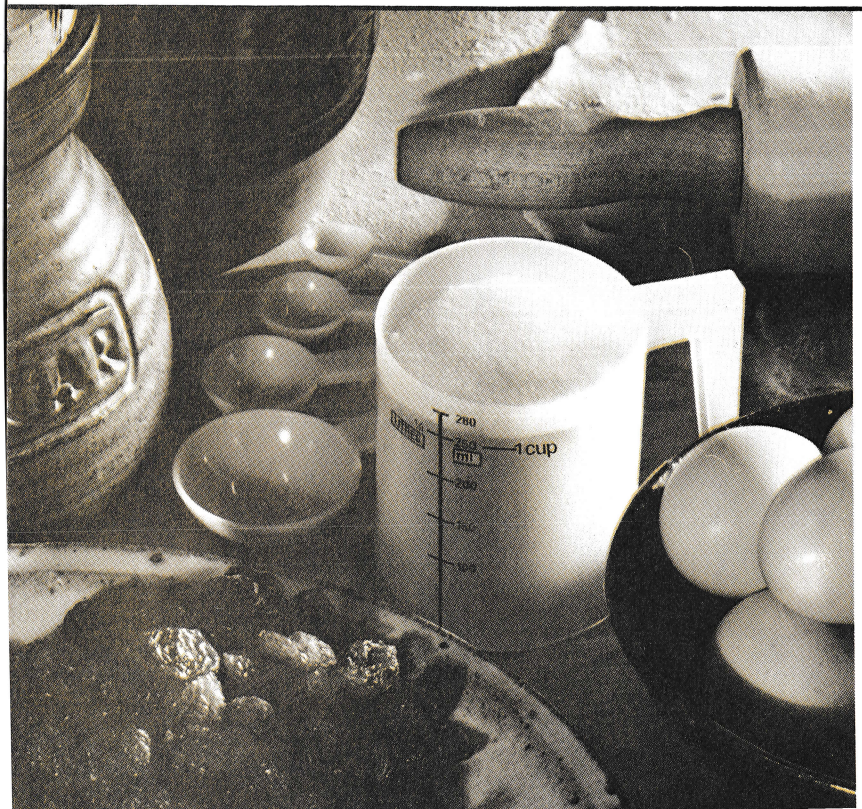
weight

Don't worry when you weigh yourself and the figures in kilograms appear higher than in stones and pounds – you'll soon learn and remember your body weight in metrics.





cooking



Cooks and housewives will now switch to metric units for weighing and measuring — and the change needn't give anybody indigestion!

There is no need to throw out old and treasured recipes. Keep your old kitchen measuring tools and continue to make the recipes as before.

Gradually, sources of recipe material will provide new recipes measured in metric units. To get the best results, buy metric measuring spoons and cups.

In metric cooking, the new basic measure is the metric cup, which holds 250 millilitres (slightly more than the old 8 fluid-ounce measuring cup). 4 cups = 1 litre.

If you want to use your old measuring cup to make up a metric recipe, you can, but you will get a smaller product. Never mix imperial and metric measures to make one recipe.

Spoon measures will be in millilitres.
1 teaspoon (t) = 5 ml

2 teaspoons (t) = 10 ml
= 1 dessertspoon (D)

3 teaspoons (t) = 15 ml
= 1 tablespoon (T)

The wrapper on a metric pack of butter will be marked in 50-gram divisions (almost 2 ounces each), so you will still be able to use the wrapper as a guide to slicing off the wanted weight of butter.

New stoves have Celsius thermostats, so foods cooked at the old 350 degrees Fahrenheit will now be cooked at 180 degrees Celsius. A "cool" 150 °C oven will be the same as the old 300 °F oven and, if you want a "hot" 450 °F, your Celsius scale will read 230 degrees.

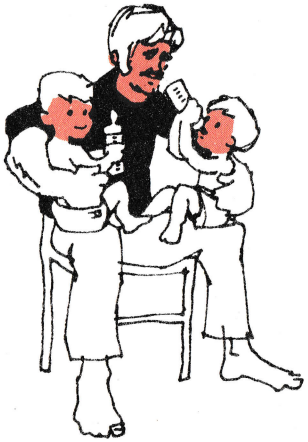
Easy basic food measurements are: 2 cups of flour weigh about 250 grams, 2 tablespoons of flour 15 grams; 1 cup of sugar weighs about 250 grams, 1 tablespoon of sugar 15 grams.

If you wish to convert a recipe from one system to the other, it is important that *all* the measurements are converted.

The simplest method is to use 25 grams in place of 1 ounce, and 25 millilitres in place of 1 fluid ounce.

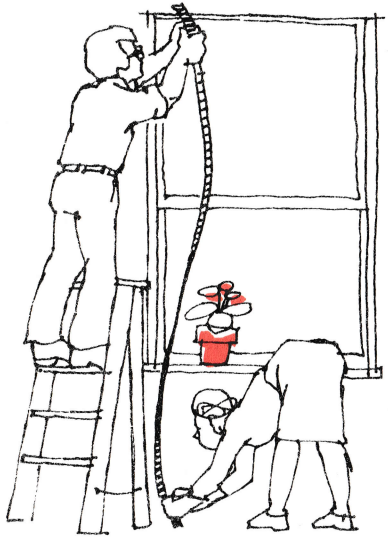
This method of conversion is suitable for family-sized recipes. If you are involved with quantity cooking and wish to convert large recipes, base the conversions on 450 grams replacing 1 pound and 570 millilitres replacing 1 pint.

If you decide to buy metric kitchen scales, they will have subdivisions of 25, 20 or 10 grams. Many scales will be marked with both metric and imperial units.



BABY FEEDING
Baby feeding bottles will be in millilitres instead of fluid ounces. The 8-fluid-ounce feeding bottle will be replaced by a 240-millilitre bottle.
BODY TEMPERATURES will be measured in degrees Celsius. Normal temperature is 37 °C. 38 °C is feverish and 40 °C is a high fever.

sewing



You will find many changes when you come to sew your first metric garment but none are difficult. A little extra attention to detail is all that is needed. All your measurements will be in metres and centimetres. (100 centimetres = 1 metre, 1 metre is just over 1 yard, 2.5 centimetres about 1 inch.)

Some changes you will meet in making a metric garment are:

Pattern: The size number will stay the same but the measurements will change. For example, a size 14 pattern stays a size 14, but the measurements will be 92-69-97 centimetres instead of 36-27-38 inches.

If you wish to use a favourite pattern with imperial measurements, conversion charts are available and shop assistants will help you.

Fabric: Widths and lengths of dressmaking fabrics start to go metric from July 1974. The width of fabric will be measured in centimetres and you will buy it in lengths measured in metres and tenths of a metre. (One-tenth of a metre = 10 centimetres.) The quantities you need will be shown on your pattern.

Zippers, etc.: Your metric pattern will show how many centimetres long your zipper should be.

Threads: These will still be sold by the reel but the length will be in metres.

Tape, ribbon, lace, etc., will be sold by the metre or tenths of a metre. Packaged tape or binding will be in metres.

Pattern Markings: Seam allowances will be marked in centimetres, for example, 1.5 cm. Other measurements normally marked on the pattern, such as hem allowances and buttonholes, will also be in centimetres.

All other sewing at home, from making soft furnishings to handicrafts, will involve the use of the metric system.

KNITTING AND CROCHET

Wool, knitting cotton and synthetic yarns are now sold in balls weighed in grams. The most common metric balls are slightly smaller so if you are using patterns in ounces, make sure you buy enough.

Some crochet hooks are now dual marked; later only metric ones will be sold. Knitting needles will also be sized in metric. Your pattern will tell you which size to buy or what adjustments to make for tight or loose work.

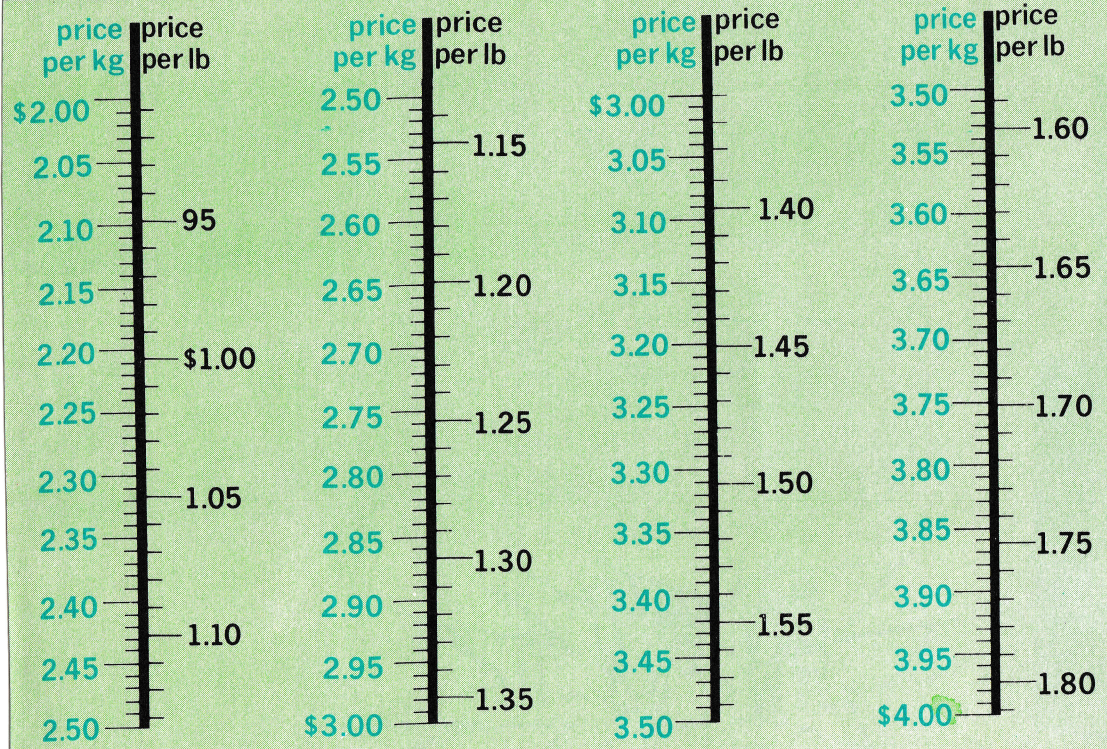
metric price guide

price per kg cents	price per lb cents
0	0
5	
10	5
15	
20	10
25	
30	15
35	
40	20
45	
50	

price per kg cents	price per lb cents
50	
55	25
60	
65	30
70	
75	35
80	
85	40
90	
95	
$1.00	45

price per kg	price per lb
$1.00	
1.05	
1.10	50
1.15	
1.20	55
1.25	
1.30	60
1.35	
1.40	65
1.45	
1.50	

price per kg	price per lb
1.50	
1.55	70
1.60	
1.65	75
1.70	
1.75	80
1.80	
1.85	85
1.90	
1.95	
$2.00	90

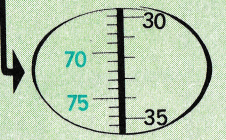


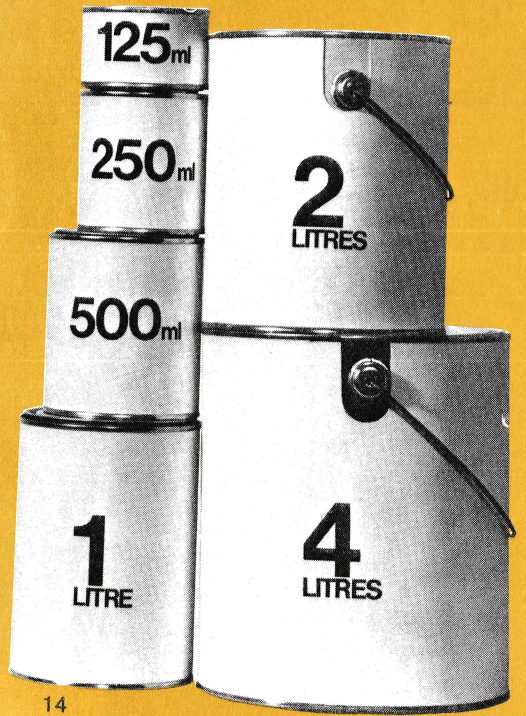
USING THE METRIC PRICE GUIDE

examples

75 cents per kilogram is the same price as 34 cents per pound.

$1.30 per lb is between $2.86 and $2.87 per kg but is closer to $2.87




125ml
250ml
500ml
1 LITRE
2 LITRES
4 LITRES


CEMENT
CEMENT
40kg bags

the home handyman

The metric change will affect the home workshop much less than you might think. Most of your tools and equipment will be as useful as ever. You will need to buy a metric rule or measuring tape but don't throw away your old ones. Provided you have metric measuring gear, there will be no need for tedious conversions from one set of units to the other.

Tool sizes will become metric, but in most cases, this will make no practical difference. For example, a 1-inch chisel will become a 25-millimetre one.

Getting used to the metric measurements of familiar things like room dimensions will take practice but this is easier than most of us suppose. If you take the plunge and start measuring in metrics you will be surprised how quickly you are happily working in metrics without even thinking about it.

At first it will probably help to remember a few simple relationships (e.g., a metre is about 10% larger than a yard) but such props should be discarded as soon as possible.

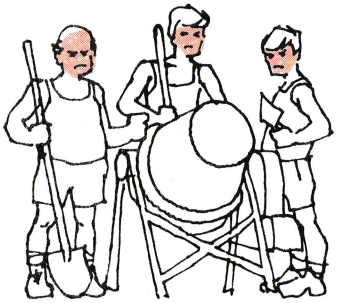
Materials sold by weight will be packed and priced by the kilogram, and those sold by the foot or yard will change to the metre. Liquids, including paint, will be packed in litres instead of gallons, with smaller quantities in hundreds of millilitres.

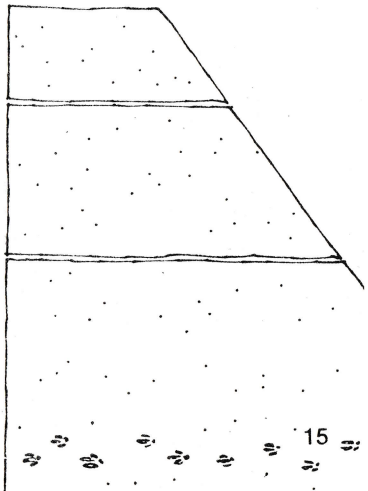
PAINT

Paint tins will be 4 litres (instead of 1 gallon), 2 litres, 1 litre, 500 millilitres, 250 millilitres and 125 millilitres. (One gallon is about 4.5 litres.)

CEMENT

Cement is now sold in 40-kilogram bags —25 to the tonne (1 000 kg) instead of the old 112-pound and 93⅓-pound bags. This makes no difference to the home handyman, who'll still mix his 4, 2, 1 proportions of chips, sand and cement for that concrete path, as before. Ready-mixed concrete will





be ordered by the cubic metre instead of the cubic yard. (1 cubic metre is about 1⅓ cubic yards.)

HOUSE MEASUREMENTS

The average New Zealand 1 100 square foot house becomes about 102 square metres in metric measurement.

Room measurements will be in metres and fractions of a metre expressed with the decimal point. Thus, measured with your metric ruler or tape, an 11ft 0 in x 9 ft 10 in bedroom becomes 3.35 m x 3.00 m. A 16 ft 5 in x 14 ft 9 in lounge goes metric as 5.00 m x 4.5 m.

GLASS

Glass will be sold by its thickness in millimetres:

Picture-frame glass — 2 mm
Window glass — 3 mm, 4 mm, 5 mm, 5.5 mm and 6 mm.

SHEATHING AND PANELLING

Hardboard, fibreboard and plywood will be sold by their dimensions in millimetres.

Some lines swing over to metrics in 1974, but the main changes take place from January 1975.

TIMBER

Timber will be ordered by the linear metre, instead of linear or super feet.

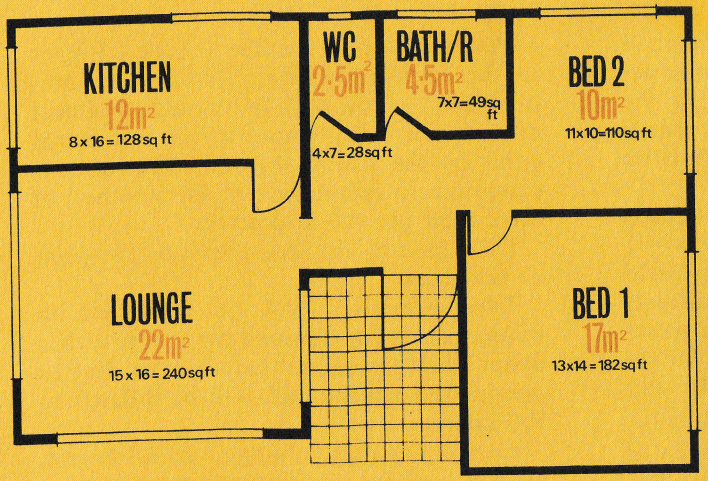
Most mills will change over to metric dimensions during the 1974 Christmas close-down, reopening in metrics in January 1975.

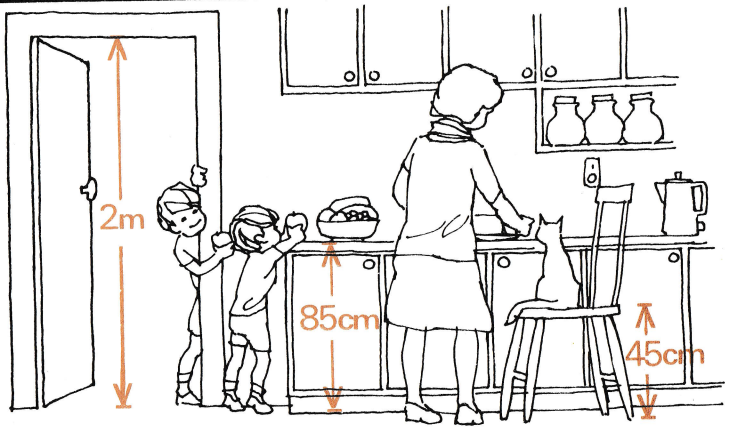
LAND AREA

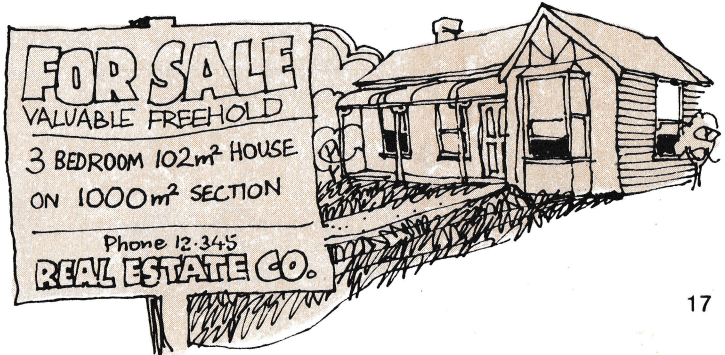
Sections will be measured in square metres (m^2), farms and other large areas in hectares (ha) or square kilometres (km^2) instead of acres, roods or perches. Basic unit of area is the square metre. (10 000 square metres = 1 hectare. 1 000 square metres is about ¼ acre. 1 hectare is nearly 2½ acres.)

GARDENING

Fertiliser pack sizes will not change appreciably, and mixing of garden chemicals, sprays, etc., will be easier, following metric directions, than before.


KITCHEN
12m²
8 x 16 = 128 sq ft
WC
2·5m²
4x7=28sq ft
BATH/R
4·5m²
7x7=49sq ft
BED 2
10m²
11x10=110sq ft
LOUNGE
22m²
15 x 16 = 240sq ft
BED 1
17m²
13x14 = 182sq ft


2m
85cm
45cm


FOR SALE
VALUABLE FREEHOLD
3 BEDROOM 102m² HOUSE
ON 1000m² SECTION
Phone 12-345
REAL ESTATE CO.

motoring

Gradually increasing use of metric road signs has helped the motorist become accustomed to the kilometre instead of the mile. Distances change to kilometres, speeds to kilometres per hour (km/h). 1 kilometre is about ⅝ of a mile.

The metric road code will be produced towards the end of 1974. From January 1 1975, the speedometers of all vehicles should show the main metric speed limit markings for warrant of fitness checks. Metric speed limits operate from April 1 1975, and for example, 30 miles an hour (30 mph) will become 50 kilometres an hour (50 km/h).

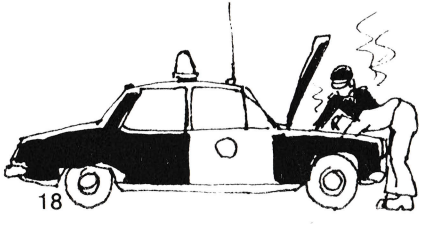
Short distances on the highway, such as distances to picnic spots, passing lanes, etc., will be shown in metres.

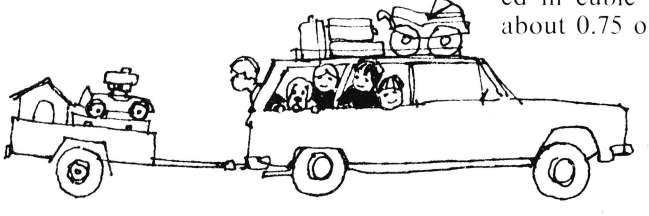
Petrol is sold by the litre (about 4.5 litres to the imperial gallon). Pumps are computerised to show both the quantity and cost of each sale, so the motorist can buy petrol either by the litre or the dollar. Petrol consumption is calculated by the number of litres used per 100 kilometres.

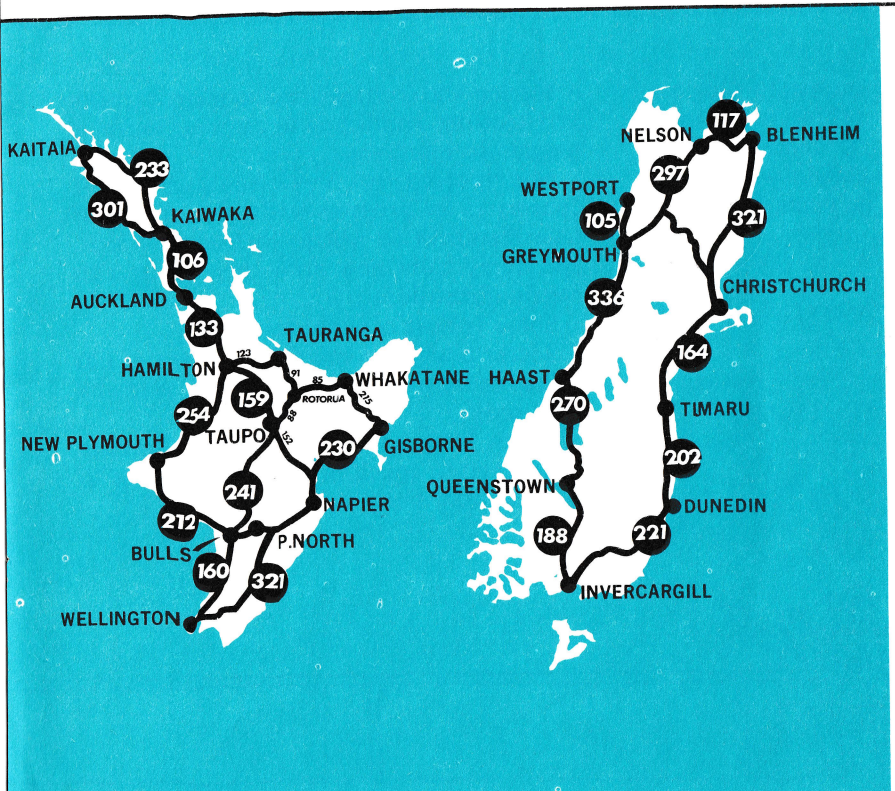
Oil is sold by the litre, grease by the gram or kilogram.

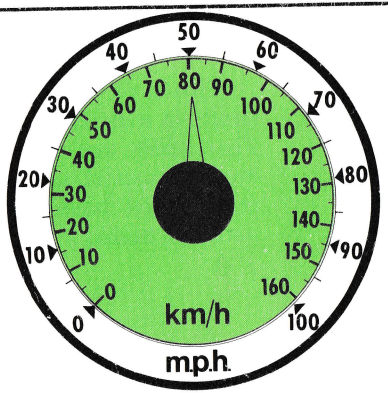
Tyre pressures will be measured in kilopascals (kPa). 1 pound per square inch is about 7 kilopascals, so that a tyre needing 28 pounds per square inch will be inflated to 190 kilopascals.

Engine ratings change to kilowatts, already used for electric motors and heating appliances. Engine capacities will be expressed in cubic centimetres. 1 horse power is about 0.75 of a kilowatt (kW).

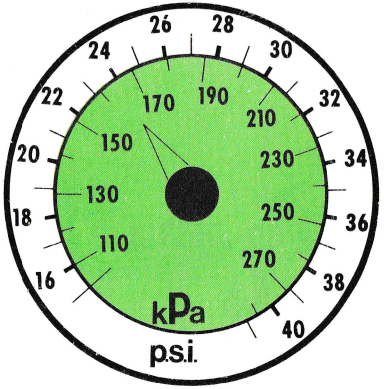








Speeds will be measured in kilometres per hour (km/h)



Tyre pressures will be measured in kilopascals (kPa)

sport

With 8 of the 9 Commonwealth Games sports in metrics this year (1974), most New Zealanders are now fairly familiar with metrics in sport, although decisions for a few main sports have yet to be made by international bodies.

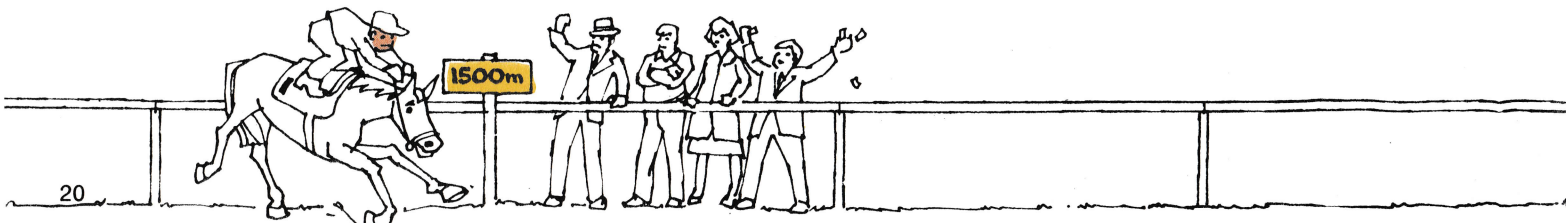
Racing and trotting are also metric: tracks and trotting handicaps in metres, jockeys' weights in kilograms.

Metrication of New Zealand's golf courses is in progress with re-marking of hole distances in metres instead of yards, and many clubs now print their cards with metric dimensions.

Some typical conversions:

Soccer pitch, maximum dimensions of 120 metres by 90 metres, instead of 130 yards by 100 yards.

Rugby League field, maximum 100 metres by 68 metres; touch in goal, 6.11 metres to the dead-ball line.



simple rules for using metrics

No "s" is added to a metric symbol when it is plural, e.g., 2 kg for two kilograms — NOT 2 kgs.

A space is used instead of a comma for breaking up groups of figures. Thus 15,000 is written 15 000. This change has been made to avoid confusion because some European countries use a comma for a decimal point.

A zero should go before numbers less than 1, e.g., 0.45 cm.

PRONUNCIATION:

kilometre is pronounced "kill-oh-metre".
kilogram is "kill-oh-gram".
millimetre is "mill-ee-metre".
tonne (1 000 kilograms) is pronounced to rhyme with "gone" to avoid confusion with the old ton.

SYMBOLS:

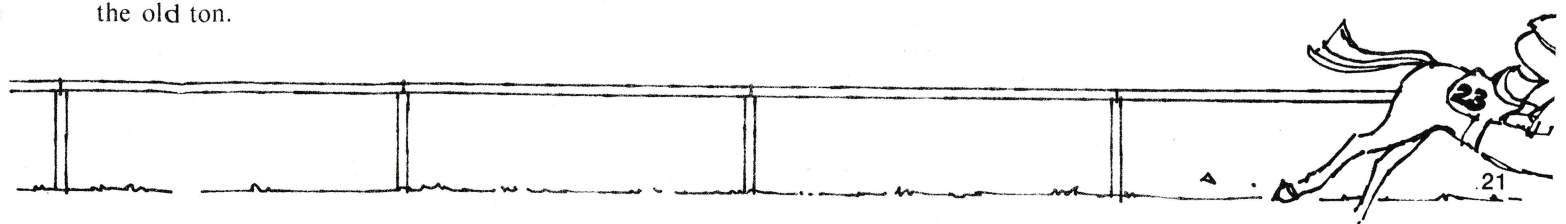
Use a capital only when the symbol involves a metric unit named after a person, such as the watt or the volt. In such cases it is W for watt, V for volt, but g for gram.

FRACTIONS:

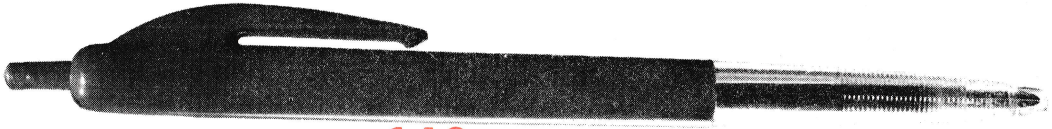
Use the decimal — e.g., 0.25 — instead of the old fraction — ¼.

SPELLING:

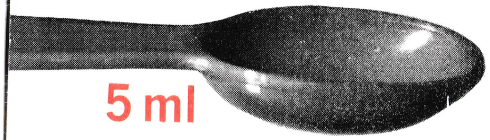
Metre for length, not meter; gram, not gramme; and litre not liter.



metric units for everyday use



140 mm



5 ml

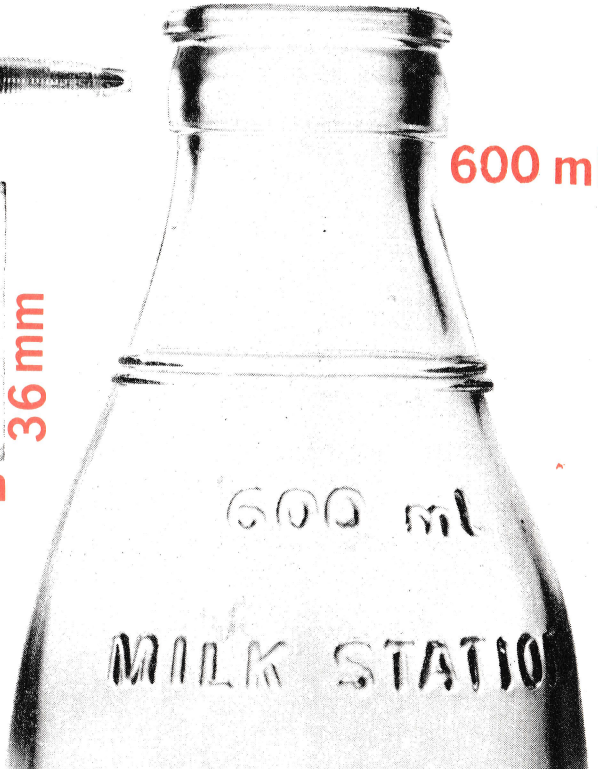
36 mm

52 mm

46 g

24 mm

20 mm



600 ml

Quantity	Unit	Symbol
temperature	degree Celsius	°C
length	millimetre	mm
	centimetre	cm
	metre	m
	kilometre	km
area	square centimetre	cm^2
	square metre	m^2
	hectare	ha
volume	cubic centimetre	cm^3
	cubic metre	m^3
capacity	millilitre	ml
	litre	l
weight or mass	gram	g
	kilogram	kg
	tonne	t
speed on land	kilometre per hour	km/h
pressure in tyres	kilopascal	kPa

A 2 cent coin weighs just over 4 grams

A 50 cent coin is just under 32 millimetres across

conversion charts

feet

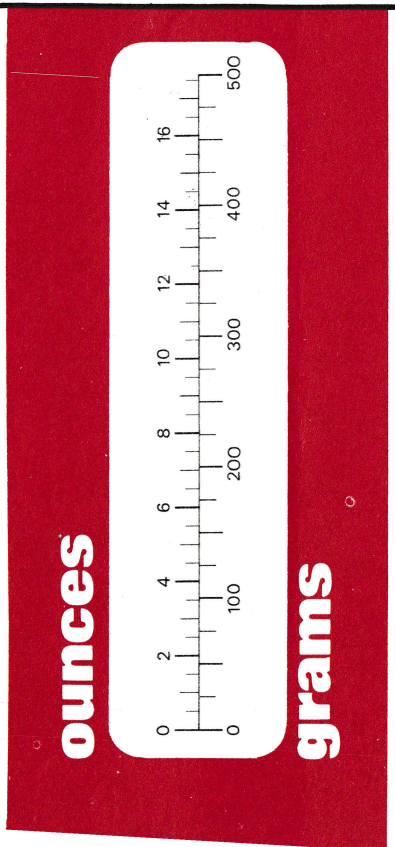
metres

yards

metres

miles

kilometres



OTHER METRIC PUBLICATIONS

The following informative leaflets, called Metric Memos, are available free from post offices or the Metric Advisory Board office, P.O. Box 10-243, Wellington:
No. 1 Everyday Units, No. 2 Everyday Equivalents, No. 3 Metrication for Typists and others concerned with the written word, No. 4 Further Commonly-used Units, No. 5 Working in Decimals, No. 6 Working in Metric Units, No. 7 Metrics in the Machine Shop, No. 8 Metric Price Guide.
Metrication timetables for most industries are available from the Board. Posters are available from time to time. The booklets "Kitchen Metrics" and "Clothing Metrics" are obtainable from booksellers.

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